4R NDIR GAS SENSOR

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Issue 1

4 Series NDIR Hydrocarbon Gas Sensor

4 Series NDIR

Part Numbers:
C1N-2654-400 &
C1N-2654-40D

DOCUMENT PURPOSE

The purpose of this document is to present the performance specification of the 4 Series NDIR Gas Sensor.

This document should be used in conjunction with the relevant Product Characterisation Note and SDCS Communication Protocol document.

Data provided in this document is valid at 20°C, 50 %RH and 1013 mBar for three months from the date of sensor manufacture. For guidance on sensor performance outside of these limits, please contact Honeywell.

APPLICATIONS

- Industrial safety, gas detection, emissions analysis/monitoring, refrigeration, and other relevant gas sensing applications
- For the purposes measuring concentrations of flammable hydrocarbon gases, for analysis, monitoring & safety

PORTFOLIO

The 4 Series sensor family is part of the extensive line of Honeywell gas sensors. To learn more about the product, or the many other gas sensors in this series, click here.

FEATURES AND BENEFITS

Digital interface – sensors have UART protocol as standard to communicate with instrument via chip select option

Enhanced resilience – environmental robustness, for performance in high temperature & humidity

Gas selection – option to select from a range of target hydrocarbon gases, with linearized output for minimal processing

Long life – proven sensing technology, designed to operate & last over ten years

Pre-calibrated – sensors calibrated during manufacturing & data is written in the sensor

Certified – Meets global performance standards in line with ATEX, IEC Ex & more

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4R NDIR HYDROCARBON GAS SENSOR

TABLE 1. TECHNICAL SPECIFICATIONS	
MEASUREMENT	
Operating Principle	Non-Dispersive Infrared (NDIR)
Gases detected	Methane gas (CH_4)[1]
Range	0 to 100 % LEL
Accuracy for CH_4 and C_3H_8 (1)	±2 %LEL or ±5 % of reading
Accuracy for C_2H_6, C_4H_{10}, C_5H_{12} , C_6H_{14} (1)	±5 %LEL or ±10 % of reading
T90 response time[2]	≤30 s
T50 response time[2]	≤10 s
Resolution	250 ppm (0.5 %LEL)
Warm-up time	<30 s
Long-time stability at zero[3]	±5 % measuring range or ±10 % of reading @ 20°C
Temp. performance (-20°C to 40°C)	± 5 % measuring range or ±10 % of reading @ 20°C
Temp. performance (40°C to 60°C)	±20 % of reading[1] @ 20°C
Repeatibility[2]	±5 %LEL or RSD<5 % @ 50 %LEL
Humidity performance[4]	±4 %LEL or ±15 % of reading with adjustment at 40°C (test: 20 %RH, 50 %RH, 90 %RH)
Measurement interval	Maximum of 1 sample per second (1 Hz)
Output (C1N-2654-400)	%LEL linear output compensated for temperature and humidity
Output (C1N-2654-40D)	%LEL linear output compensated for temperature, humidity, and pressure
Serial communication	UART with Chip Select
ENVIRONMENTAL	
Operating temperature range	-20°C to 60°C
Operating humidity range (C1N-2654-400)	0 %RH to 85 %RH (non-condensing)
Operating humidity range (C1N-2654-40D)	0 %RH to 100 %RH (condensing reduction)
Operating pressure range	800 mbar to 1200 mbar
Recommended storage temperature	0°C to 40°C
Recommended flow rate[7]	200 mL/min
LIFETIME	
Operating Life	>10 years in air
Warranty[8]	12 months from date of despatch
PHYSICAL CHARACTERISTICS	
Weight	< 7 g
Contact material (pin)	Brass & gold plating
Outer plastic body material	PEI (black)

[1] The sensor is precalibrated and configurable to measure saturated straight chain hydrocarbons - CH_4 /C_2H_6/C_3H_8/C_4H_{10}/C_5H_{12}/C_6H_{14} gas concentration. The default gas is methane. The unit of measurement is exppressed as %LEL. Unless otherwise stated, Table 1 performance specifications are valid for methane gas (CH_4). For other HC gases please also refer to Table 5 and product characterization note or contact Honeywell for support..

[2] Specifications are valid at 20°C, 50 %RH and 1013 mbar.

[3] For a period of 24 hours per day over a total of 30 days.

[4] Variation of reading at 10 %RH and at 90 %RH compared to reading @ 50%RH at 50 %FS

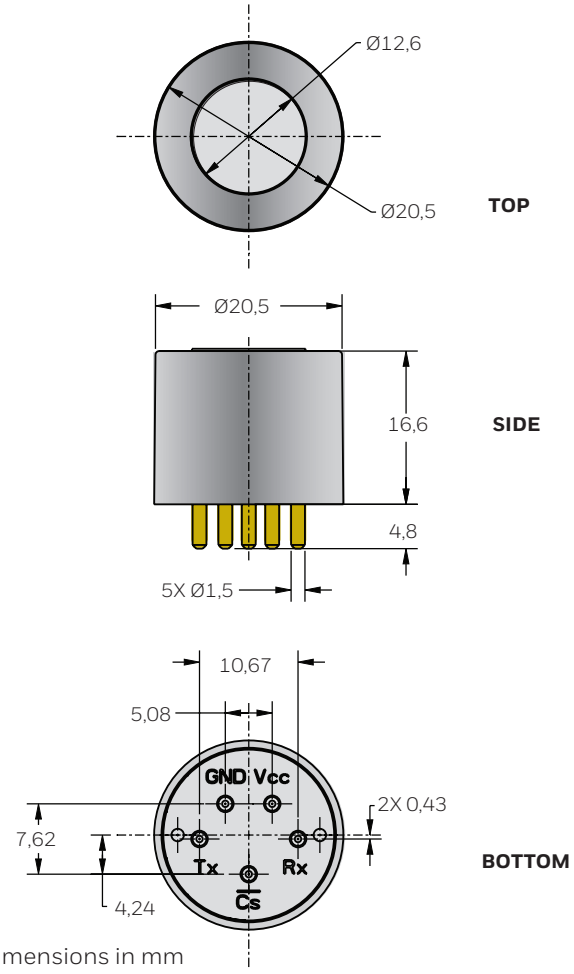
[5] Condensation control activates for 10 minutes once humidity exceeds the set threshold.

[6] For compatibility with the whole iseries product range, the supply voltage should be 3.3 V.

[7] The flow rate range is from 50 ml/min to 500 ml/min for one sensor

[8] Warranty can be extended on request. Subject to Honeywell Terms & Conditions.

Product Dimensions



All dimensions in mm

All tolerances ±0,15 mm unless otherwise stated.

TABLE 2. PIN OUT	
Pin	**Description**
V_{cc}	Positive power supply
GND	Ground
Rx	Data transmitted from instrument to sensor
Tx	Data transmitted from sensor to instrument
CS	Chip Select

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TABLE 3. ELECTRICAL SPECIFICATIONS C1N-2654-400†

	Min.	Typ.	Max.	Unit
Supply Voltage (Vdd)	3	3.3	5	Vdc
Electrical specifications - work at 3.3 V				
Peak supply current	–	6.2	–	mA
Current: at stand-by mode	–	72	90	µA
Current: at active mode	–	475	570	µA
Average power consumption	–	1.6	2.8	mW
Electrical specifications - work at 5 V				
Peak supply current	–	10	–	mA
Current: at stand-by mode	–	73	95	µA
Current: at active mode	–	477	570	µA
Average power consumption	–	2.4	2.8	mW

† This SKU doesn't have condensing reduction feature

TABLE 4. ELECTRICAL SPECIFICATIONS C1N-2654-400D

	Min.	Typ.	Max.	Unit
Supply Voltage (Vdd)	3	3.3	5	Vdc
Electrical specifications - work at 3.3 V				
Peak supply current	–	6.2	–	mA
Current: at stand-by mode	–	72	90	µA
Current: at active mode	–	475	570	µA
Average power consumption	–	1.6	2.8	mW
Electrical specifications - work at 5 V				
Peak supply current	–	10	–	mA
Current: at stand-by mode	–	73	95	µA
Current: at active mode	–	477	570	µA
Average power consumption	–	2.4	2.8	mW
Automatic condensing reduction - work at 3.3 V				
Peak supply current	–	125	130	mA
Current: at active mode for condensing reduction	–	40	45	mA
Average power consumption (with condensation reduction) ††	–	130	150	mW
Automatic condensing reduction - work at 5 V				
Peak supply current	–	148	160	mA
Current: at active mode for condensing reduction	–	46	50	mA
Average power consumption (with condensation reduction) ††	–	230	250	mW

†† Condensation control activates for 10 minutes once humidity exceeds the set threshold.

TABLE 5. TEST DATA

Applied Gas	Methane (CH_4)	Ethane (C_2H_6)	n-Propane (C_3H_8)	n-Butane (C_4H_{10})	n-Pentane (C_5H_{12})	n-Hexane (C_6H_{14})
Range	0 % Vol to 5 % Vol	0 % Vol to 3 % Vol	0 % Vol to 2.1 % Vol	0 % Vol to 1.5 % Vol	0 % Vol to 1.4 % Vol	0 % Vol to 1 % Vol
Response time (T90)[1]	9 s	13 s	11 s	18 s	20 s	24 s
Resolution[1]	95 ppm	28 ppm	11 ppm	9 ppm	12 ppm	12 ppm
Warm-up time	<30 s	<30 s	<30 s	<30 s	<30 s	<30 s
Long-time stability at zero [2]	≤±2 % LEL					
Temperature performance at zero [3]	<±2 %LEL @ (-20°C to 40°C) <±3 %LEL @ (40°C to 60°C)					
Repeatability[1]	RSD<0.5 % @ 50 %LEL	RSD<0.5 % @ 50 %LEL	RSD<0.5 % @ 50 %LEL	RSD<0.5 % @ 50 %LEL	RSD<0.5 % @ 50 %LEL	RSD<0.5 % @ 50 %LEL
Humidity performance at zero[4]	<± 1% LEL @ (0 %RH to 75 %RH] <4 % LEL @ (75 %RH to 95 %RH] without condensing reduction					
Condensing reduction performance at zero[5]	<4 % LEL that sudden temperature changes from -20°C to 20°C					

[1] Specifications are valid at 20°C, 50 %RH and 1013 mbar. Applied zero gas and 50 %LEL target span gas
[2] For a period of 24 hours per day over a total of 30 days
[3] The slope of temperature is 1°C/min.
[4] Variation of reading at 10 %RH and at 90 %RH compared to reading @ 50 %RH at 50 %FS
[5] Condensation control activates for 10 minutes once humidity exceeds the set threshold
The slope of temperature is 1°C/min.
The supply voltage should be 3.3 V
The flow rate range is 200ml/min for one sensor

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TABLE 5. 4R NDIR PARAMETERS

4R NDIR parameters		Default Values	Configurable Range	Customizable:[1] Implemented by Honeywell (non-configurable through the communication protocol)	Configurable:[2] The parameter can be changed through the communication protocol by users	Notes
OEM lock	OEM code (First layer)		No more than 5 characters (ASCII format)	✓	×	Once this code has been set by user, it is not possible to change it and can only be used once.
	Partner code (Second layer)		No more than 5 characters (ASCII format)		✓	Once this code has been set by user, it is not possible to change it and can only be used once.
User Factor	–	User factor0: 100 User factor1: 100 UF 2-3: Reserved UF 4-9: Customizable	User factor range is from 1 to 255		✓	User factors can be added to include auto-compensation for using different membranes or instruments. 2 are reserved and 6 can be customized. User factor 0 and 1 programmed into the sensor during manufacturing. Additional User Factors can be added to the selectable list during the manufacturing process. This user factor has to be provided by the user.
Unit of measure[1]	–	% LEL	% LEL, % Vol, ppm		✓	default unit is %LEL
Calibration	Zero	0 %LEL	-		×	The calibration points are defined by the zero and span values. Zero-Calibration uses clean air or Nitrogen gas.
	Span	50 %LEL	[30 %LEL, 70 %LEL]		✓	Span is the calibration point that is done in the presence of the target gas. The span concentration can be configured through the communication protocol, it is recommended to use 50 %LEL to ensure better accuracy.
Alarms	Low	10 %LEL	Limit Low Lower: 0 Limit Low upper: 60		✓	The alarm will be flagged when the reading reaches Alarm-Low.
	High	20 %LEL	Limit High Lower: 0 Limit High upper: 60		✓	The alarm will be flagged when the reading reaches Alarm-High.
Predictive Calibration	Countdown timer (Cal due days)*	180 Days	1 Day ≥		✓	The countdown restarts when the sensor is calibrated. The alarm will be flagged when the countdown reaches 0.
End of Life	Countdown timer (EOL)	5000 Days	–	✓	×	The countdown timer is set for 5000 days, i.e. 14 years
Deadband	Active by default	✓	–		✓	Outgoing: As the reading increases, it will read zero until it exceeds the outgoing threshold
	Incoming	1 %LEL	Whole measurement range		✓	Incoming: As the reading decays down, it will read zero once it
	Outgoing	3 %LEL	Incoming < Outgoing		✓	Outgoing: As the reading increases, it will read zero until it exceeds the outgoing threshold

[1] Customizable: Implemented by Honeywell (Non- configurable through the communication protocol)

[2] Configurable: The parameter can be changed through the communication protocol by users

TABLE 6. PRODUCT APPROVAL				
ATEX marking	Ex ia op is IIC Ga Ex ia op is I Ma			
Applicable standards	IEC 60079-0, Explosive atmospheres - Part 0: Equipment General requirements, Edition 7.0 Revision, Date 2017 IEC 60079-11, Explosive Atmospheres - Part 11: Equipment Protection by Intrinsic Safety "i", Edition 6.0 Revision, Date 2011 IEC 60079-28, Explosive atmospheres - Part 28: Protection of equipment and transmission systems using optical radiation, Edition 2 Revision. Date 2015 Protocol: 904-800-142 Smart Device Communication Standard ATEX Performance Standard: EN 60079-29-1, 2016 (EN50271 compliance)			
EMC standard	EN 50270:2015			
SGS verification no.	SHEM250800530201HSC			
Test Summary				
Emission Part	**Standard**	**Method**	**Requirement**	**Result**
Radiated emissions (30 MHz to 1 GHz)	EN 50270: 2015	EN 61000-6-4:2007+ A1:2011	n/a	Pass
Immunity Part	**Standard**	**Method**	**Requirement**	**Result**
Electrostatic discharge	EN 50270: 2015	EN 61000-6-4:2009	6 kV contact discharge 8 kV air discharge	Pass
Radiated immunity (80 MHz to 1 GHz, 1.4 GHz to 2.0 GHz, 2.0 GHz to 2.7 GHz)	EN 50270: 2015	EN IEC 61000-4-3: 2020	80 MHz to 1000 MHz 20 V/m, 10 V/m, 80 %, 1 KHz sinusoidal Amp. Mod 1400 MHz, 2000 MHz 10 V/m, 80 %, 1 KHz sinusoidal Amp. Mod 2000 MHz to 2700 MHz 3 V/m, 80 %, 1 KHz sinusoidal Amp. Mod	Pass
Power frequency magnetic field	EN 50270: 2015	EN IEC 61000-4-8: 2014	50 Hz, 60 Hz, 30 A/m	Pass
Internal Source	**Upper Frequency**			
Below 108 MHz	1 GHz			
108 MHz to 500 MHz	2 GHz			
500 MHz to 1 GHz	5 GHz			
Above 1 GHz	5 times the highest frequency or 6 GHz whichever is less			

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgment or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items that Honeywell, in its sole discretion, finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

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Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this writing. However, Honeywell assumes no responsibility for its use.

⚠ WARNING
MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

SAFETY NOTE

This sensor is designed to be used in safety-critical applications. To ensure that the sensor and/or instrument in which it is used, are operating properly, it is a requirement that the function of the device is confirmed by exposure to target gas (bump check) before each use of the sensor and/or instrument. Failure to carry out such tests may jeopardize the safety of people and property.

For more information

Honeywell Sensing Solutions services its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing, or the nearest Authorized Distributor, visit automation.honeywell.com/hss or call:

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